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Central Kitsap Wastewater Treatment Plant Class II Inspection January 26-28, 1998

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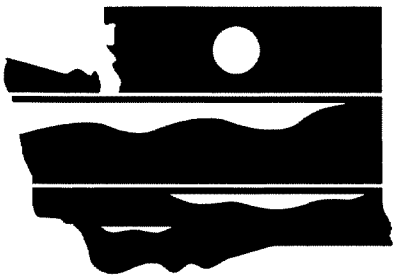

Central Kitsap Wastewater Treatment Plant Class II Inspection January 26-28, 1998

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Abstract

A Class II inspection was conducted at the Central Kitsap Wastewater Treatment Plant on January 26-28, 1998. The plant was performing well during the inspection. The effluent met National Pollutant Discharge Elimination System permit limits for all parameters: 5-day carbonaceous biochemical oxygen demand, total suspended solids, fecal coliform, and pH.

Modifications to the plant scheduled for 1999 should remedy some conditions found during the inspection. These conditions included unsteady flow in the Parshall flume, the lack of a continuously reading totalizer, the inability to include septage contributions in samples of plant influent, and the collection of rags on the influent sampler intake. Central Kitsap should also review its CBOD analysis procedures.

Organic compounds found in the effluent were in concentrations below applicable water quality criteria. Copper was found in the effluent in concentrations exceeding acute and chronic water quality criteria. TSDCALC7 indicates no reasonable potential to violate water quality standards for copper or any of the other metals found in the effluent.

The sludge sample exceeded the fecal coliform count for EPA Class A sewage sludge but met Class B requirements. All metals found in the sludge were in concentrations lower than EPA sludge application limits and ceiling concentrations for application of municipal sludge.

Summary

Flow Measurements

The wastewater treatment plant influent Parshall flume and effluent weir were both in operation at the time of the inspection. Central Kitsap reports influent flow to Ecology. The water level in the flume correlated with the meter readout within the uncertainty introduced by the unsteady flow in the flume. It is recommended that a totalizer be installed at the time of the Phase IIB modifications to the headworks scheduled for 1999.

NPDES Permit Compliance/General Chemistry

Influent and effluent data indicate effective removal of the conventional parameters 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS). Low counts of fecal coliform in the effluent also indicate effective treatment. The effluent met permit limits for all parameters: 5-day carbonaceous biochemical oxygen demand ($CBOD_5$ or BODINH), total suspended solids (TSS), fecal coliform, and pH.

As a result of the way septage was being routed through the plant, it was not possible to determine actual removal efficiencies. This problem as well as the problem of rags blocking the influent sampler intake should be rectified in the new headworks scheduled for construction in 1999.

Industrial Contributors

The Bangor wastewater contribution to the Central Kitsap collection system was found to comprise 15% of the total inflow to the Central Kitsap WWTP. The Keyport flow is intermittent and typically at a rate of approximately 65,000 to 85,000 gpd. This corresponds to 1% - 2% of the total inflow to the Central Kitsap WWTP.

The Bangor and Keyport wastewater contributions to the Central Kitsap sewage collection system were each weaker in terms of TSS and BOD_5 than was the total influent to Central Kitsap.

Split Sample Results

Samples were split to determine the comparability of Ecology and permittee laboratory results and sampling methods. Ecology and Central Kitsap samples compared closely in strength, both for influent and effluent samples, suggesting the sampling technique was good. The results of the Central Kitsap CBOD analyses appeared to be high, indicating a lack of inhibition of non-carbonaceous degradation. Central Kitsap should review CBOD procedures with attention paid to the inhibitor and its application.

Priority Pollutant Scans

Organics

Twenty volatile organic analysis (VOA) compounds were detected in the Central Kitsap influent samples collected. All VOA compounds other than acetone (a possible laboratory contaminant) were found in low concentrations. Three VOA compounds were detected in the effluent samples collected. All VOA compounds in the effluent were at concentrations well below applicable water quality criteria.

Sixteen BNA (base-neutral acid extractables) were detected in the Central Kitsap influent samples collected. Twelve BNA compounds were detected in the Central Kitsap effluent samples collected. All BNA compounds in the effluent were at concentrations below applicable water quality criteria. Nine VOA compounds were detected in the Bangor wastewater sample and twelve VOA compounds were detected in the Keyport wastewater sample. Other than acetone all of these compounds were detected in low concentrations.

Metals

Five priority pollutant metals were detected in the Central Kitsap effluent composite sample. Copper (12.4 µg/L) was found in the effluent in concentrations exceeding acute and chronic water quality criteria. TSDCALC7 indicates no reasonable potential for the receiving water to violate water quality standards for copper or any of the other metals found in the effluent.

Eight priority pollutant metals were detected in the Bangor sample. Of these, copper, nickel and selenium were found in concentrations greater than those found in the Central Kitsap influent sample. Comprising 15% of the inflow to the Central Kitsap WWTP, Bangor is a significant contributor of metals to the plant. Seven priority pollutant metals were detected in the Keyport sample. Of these, cadmium, chromium, lead, nickel, and zinc were found in concentrations greater than those in the Central Kitsap influent sample. Comprising 1%-2% of the inflow to the Central Kitsap plant, Keyport was a less significant source of metals to the plant at the time of the inspection.

Sludge

The sludge sample exceeded the fecal coliform count for EPA Class A sewage sludge but met Class B requirements. Eleven priority pollutant metals were detected in the sludge sample. Zinc was found in the highest concentration (630 mg/Kg-dry). All metals were found in concentrations lower than EPA sludge application limits and ceiling concentrations for application of municipal sludge.

Recommendations

- A totalizer should be installed at the time of the Phase IIB modifications to the headworks scheduled for 1999.

- The unsteadiness in the current flow measurement device should be remedied with the Phase IIB modifications.

- The new headworks should be designed and constructed so that septage, but no return flows, are included in the flow at the influent sampling location.

- The influent sampler intake should be located in the new plant so that rags are not collected on it.

- Central Kitsap should review CBOD procedures with attention paid to the inhibitor and its application.

Introduction

A Class II inspection was conducted at the Central Kitsap Wastewater Treatment Plant (WWTP) January 26-28, 1998. Conducting the inspection were Norm Glenn and Steven Golding of The Washington State Department of Ecology Environmental Assessment Program in Olympia. Assisting from the Central Kitsap staff were Ralph DeClements, Operations Supervisor, and Craig Hanson, Laboratory Coordinator. Mike Dawda of the Ecology Northwest Regional Office requested the inspection.

Facility Description

The Central Kitsap Wastewater Treatment Plant is a regional facility designed to serve the central portion of Kitsap County (Figure 1). The facility began operating in 1979 as a conventional activated sludge secondary treatment facility. The facility provides sewage service for the cities of Silverdale, Keyport, and Poulsbo, Central Kitsap area, the Naval Submarine Base Bangor (Bangor), and the Naval Undersea Warfare Engineering Station at Keyport (Keyport). The plant treats sludge, received in the form of septage, from Manchester, Suquamish, and Kingston WWTPS. The facility was recently upgraded to improve the operational limitations of the plant and to improve plant safety and reliability. These improvements also resulted in higher hydraulic and organic design capacities.

The liquid stream treatment at the facility includes comminution, influent flow measurement with Parshall flumes, primary sedimentation, biological treatment (conventional activated sludge) with a fine bubble diffuser system, secondary sedimentation, UV disinfection system, and effluent flow measurement with rectangular weirs (Figure 2). The solids removed in the primary clarifiers (raw sludge), and the septage received from the sewer service area are degritted. The solids removed in the secondary clarifiers (secondary sludge), septage and raw sludge are thickened in gravity thickeners. The thickened sludge from the gravity thickeners and scum from the primary/secondary clarifiers are digested in one of the two anaerobic digesters. The anaerobically digested sludge is chemically conditioned with polymers, and dewatered by a filter press. The recycle streams which include supernatant from gravity thickeners and anaerobic digesters, and filtrate from the filter press are returned to the headworks for further treatment.

The dewatered sludge from the facility is transported to Port Townsend WWTP for composting or transported to eastern Washington for application on agricultural lands. The grit removed from the septage and raw sludge is disposed at a local landfill.

Secondary treated and disinfected effluent from the facility is discharged to Port Orchard Bay, Puget Sound, through a 36-inch line with an outfall constructed so as to discharge the effluent 3192 feet offshore at a depth of 46 feet below mean lower low water. The diffuser consists of a 30-inch diameter 120-foot long pipeline with twelve, 5-inch diameter ports. The port spacing is 10 feet, with consecutive ports facing opposite directions.

The current NPDES permit #WA-003052-0 was issued on May 28, 1997 and expires on June 30, 2001.

Objectives

Objectives of the inspection included:

1. Evaluate NPDES permit compliance.

2. Evaluate influent loading from Bangor and Keyport.

3. Evaluate sampling and laboratory procedures with split samples.

4. Compare effluent sample results with state and federal water quality criteria.

Procedures

Composite samples were taken at Central Kitsap influent (Inf-E), Central Kitsap effluent (Eff-E), Bangor (Bngr-E) and Keyport (Kprt-E) locations. Ecology Isco composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. Influent, aeration, effluent, septage, and sludge were collected as grab samples as well as Bangor and Keyport wastewaters discharged to the Central Kitsap collection system. Sampler configurations and locations are summarized in Figure 2 and Appendix A.

Central Kitsap also collected composite samples of influent (Inf-C) and final effluent (Eff-C). The Central Kitsap samplers were set to collect equal volumes of subsamples every 20 minutes. Inf-E, Inf-C, Eff-E, and Eff-C composite samples were split for both Ecology and Central Kitsap laboratory analyses. A more detailed description of Ecology and Central Kitsap sampling procedures appears in Appendix B. The sampling schedule, parameters analyzed, and sample splits are included in Appendix C.

Samples for Ecology analysis were kept on ice and delivered to Manchester Laboratory the day following the date of collection, maintaining field chain-of-custody tracking on all samples. A summary of analytical methods, references, and the laboratory conducting the analysis is given in Appendix D. For a discussion of QA/QC, see Appendix E. Cleaning procedures appear in Appendix F. A complete table of VOA, BNA, and metals scan results appears in Appendix G. A glossary of terms appears in Appendix H.

Results and Discussion

Flow Measurements

The WWTP has an influent Parshall flume and an effluent weir. Both were in operation at the time of the inspection. Central Kitsap reports influent flow to Ecology to represent the plant's total flow. Central Kitsap performs an in-house calibration of the influent Parshall flume every 9 months. The water level in the flume correlated with the meter readout within the uncertainty introduced by the unsteady flow in the flume. The measured flow for January 27, 1998 was 4.600 MGD. The measured flow for January 28,1998 was 4.497 MGD.

The influent flow meter reads out in instantaneous measurements and midnight to midnight total measurements. Because there is no totalizer, it is not possible to obtain total measurements for other periods. It is recommended that a totalizer be installed at the time of the Phase IIB modifications to the headworks scheduled for 1999. Flow in the Parshall flume was not steady, reducing the accuracy of instantaneous readings. This situation is expected to be remedied with installation of the new headworks.

NPDES Permit Compliance/General Chemistry

Influent and effluent data indicate effective removal of the conventional parameters BOD_5 and TSS (95% removal of each). Low counts of fecal coliform in the effluent also indicate effective treatment (Table 1). The effluent met National Pollutant Discharge Elimination System (NPDES) permit limits for all parameters: 5-day carbonaceous biochemical oxygen demand (CBODI or BODINH), total suspended solids (TSS), fecal coliform, and pH (Table 2).

Although 95% removal efficiencies were calculated for both BOD_5 and TSS, it was not possible to determine actual efficiencies because septage contributions were sent to a gravity thickener and then the overflow from the thickener entered the plant downstream of the Parshall flume where it could not be sampled. Because of this, the septage contributions trucked from the Manchester, Suquamish, and Kingston WWTPs were not included in Central Kitsap or Ecology influent samples. This problem is expected to be rectified in the new headworks scheduled for construction in 1999 (DeClements, 1998). The new headworks should be designed and constructed so that septage but no return flows are included in the flow at the influent sampling location.

During the reconnaissance visit on November 18, 1997, rags were found covering the Central Kitsap influent intake. The rags could be expected to act as filters, reducing the BOD_5 and TSS of the samples collected so that they would not be representative. The sampling location for the new headworks should be designed to eliminate or reduce this problem.

A comparison of influent and effluent NH_3 and $NH_3 + NO_2$-N concentrations indicate that partial nitrification was occurring at the time of the inspection. The effluent ammonia concentration was reduced to less than half of the influent concentration, based on an Inf-C

NH_3 concentration of 20.3. Nitrate-nitrite concentrations increased a corresponding amount. The Ecology analysis of NH_3 for Inf-E doesn't fit the $N0_3$ + NO_2-N data which shows partial nitrification across the plant. The Ecology Inf-E NH_3 result of 2.23 appears to be anomalous.

Industrial Contributors

Wastewater contributions to the Central Kitsap sewage collection system from Bangor and Keyport were monitored and sampled as part of the inspection. The flow of the Bangor wastewater contribution to the Central Kitsap collection system was measured to be 685,000 gpd during the inspection. This corresponds to 15% of the total inflow to the Central Kitsap WWTP. A flow measurement was not obtained for the Keyport wastewater entering the Central Kitsap collection system. The flow is intermittent and typically at a rate of approximately 65,000 to 85,000 gpd (Hanson, 1998). This corresponds to 1% - 2% of the total inflow to the Central Kitsap WWTP.

The Bangor and Keyport wastewater contributions to the Central Kitsap sewage collection system were each weaker (121 mg/L BOD_5 and 62 mg/L BOD_5 respectively) than was the total influent to Central Kitsap (Inf-E - 156 mg/L BOD_5). TSS concentrations in the wastewater contributions from Bangor (103 mg/L) and Keyport (53 mg/L) were also lower than was the concentration in Inf-E (151 mg/L).

Split Sample Results

Samples were split to determine the comparability of Ecology and permittee laboratory results and sampling methods (Table 3). Ecology and Central Kitsap samples compared closely in strength, both for influent and effluent samples, suggesting that sampling technique was good. Ecology and Central Kitsap laboratory analyses compared closely for influent and effluent BOD_5. The Central Kitsap CBOD analyses for Inf-E and Inf-C were higher in concentration than the Ecology results. Central Kitsap CBODs were no different from the BOD_5 results. This indicates that non-carbonaceous degradation was not being inhibited as it should have been. The CBOD results were expected to be lower than they were, since the ammonia concentration in the influent samples was high (about 20 mg/L). Ecology analyses of CBOD for the influent samples were lower as expected. Central Kitsap should review CBOD procedures with attention paid to the inhibitor and its application.

Other split sample results were comparable with the exception of Ecology's Inf-E ammonia result of 2.2 mg/L, an unexplainably low result, and Ecology's Inf-C TSS result of 404 mg/L, a high concentration that may be a consequence of the inhomogeneous nature of municipal wastewater influent.

Priority Pollutant Scans

Organics

Twenty VOA (volatile organic analysis) compounds were detected in the Central Kitsap influent samples tested (Table 4). Acetone was the VOA compound found in the highest concentration in the influent (72 µg/L). Because acetone is used for laboratory cleaning, the concentration found may not be representative of the influent. The finding of no detectable acetone in the second influent grab sample supports this interpretation. All other VOA compounds were found in low concentrations (4.4 µg/L or lower).

Three VOA compounds were detected in the effluent samples detected. Of these, chloroform (2.1 µg/L) was found in the highest concentration. All VOA compounds in the effluent were at concentrations well below applicable water quality criteria (Ecology, 1997).

Sixteen BNA (base-neutral acid extractables) were detected in the Central Kitsap influent samples collected. The BNA compounds found in the highest concentrations were 3B-coprostanol (32 µg/L est.) and benzoic acid (23 µg/L est.). All other BNA compounds were found in low concentrations (13 µg/L est. or lower).

Twelve BNA compounds were detected in the Central Kitsap effluent samples collected. 3B-coprostanol (2.4 µg/L est.), benzoic acid (0.64 µg/L est.), and bis(2ethylhexyl)phthalate (0.31 µg/L est.) were detected in the highest concentrations in the effluent. All other BNA compounds were at a concentration of 0.14 µg/L or lower. All BNA compounds in the effluent were at concentrations below applicable water quality criteria.

Single grab samples were analyzed for VOAs at Bangor and Keyport. Nine VOA compounds were detected in the Bangor wastewater sample collected. Other than acetone (84µg/L), all VOA compounds detected were at a concentration of 2.7µg/L or lower. Twelve VOA compounds were detected in the Keyport wastewater sample. Other than acetone (244 µg/L), all VOA compounds detected were at a concentration of 3.7 µg/L or lower.

Metals

Five priority pollutant metals were detected in the Central Kitsap effluent composite sample (Table 4). Copper (12.4 µg/L) was found in the effluent in concentrations exceeding acute and chronic water quality criteria. With an acute dilution factor of 60 and a chronic dilution factor of 190, TSDCALC7 indicates no reasonable potential to violate water quality standards for copper or the other metals found in the effluent.

Eight priority pollutant metals were detected in the Bangor sample. Of these, copper, nickel, and selenium were found in concentrations greater than those found in the Central Kitsap influent sample. Comprising 15% of the inflow to the Central Kitsap WWTP, Bangor is a significant contributor of metals to the plant. Seven priority pollutant metals

were detected in the Keyport sample. Of these, cadmium, chromium, lead, nickel, and zinc were found in concentrations greater than those in the Central Kitsap influent sample. Comprising 1%-2% of the inflow to the Central Kitsap plant, Keyport was a less significant source of metals to the plant at the time of the inspection.

Sludge

The dried sludge sample contained 16.5% solids and 11.5% volatile solids. The fecal coliform count was 4,788,000/100g-dry (790,000/100g-wet - Table 1). This exceeds 1,000/g-dry (100,000/100g-dry) maximum limit for Class A sewage sludge in accordance with EPA regulations (EPA, 1993). Class A sewage sludge is suitable for use on agricultural lands without time restrictions to harvesting. The sludge sampled met the Class B sewage sludge limit of 200,000,000/100g-dry. Class B sewage sludge may be applied to agricultural lands with certain restrictions.

Eleven priority pollutant metals were detected in the sludge sample (Table 5). Zinc was found in the highest concentration (630 mg/Kg-dry). All metals were found in concentrations lower than EPA sludge application limits and ceiling concentrations for application of municipal sludge.

References

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EPA, 1993. Standards for the Use and Disposal of Sewage Sludge: Final Rules. U.S. Environmental Protection Agency. 40 CFR Part 257.

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Figures

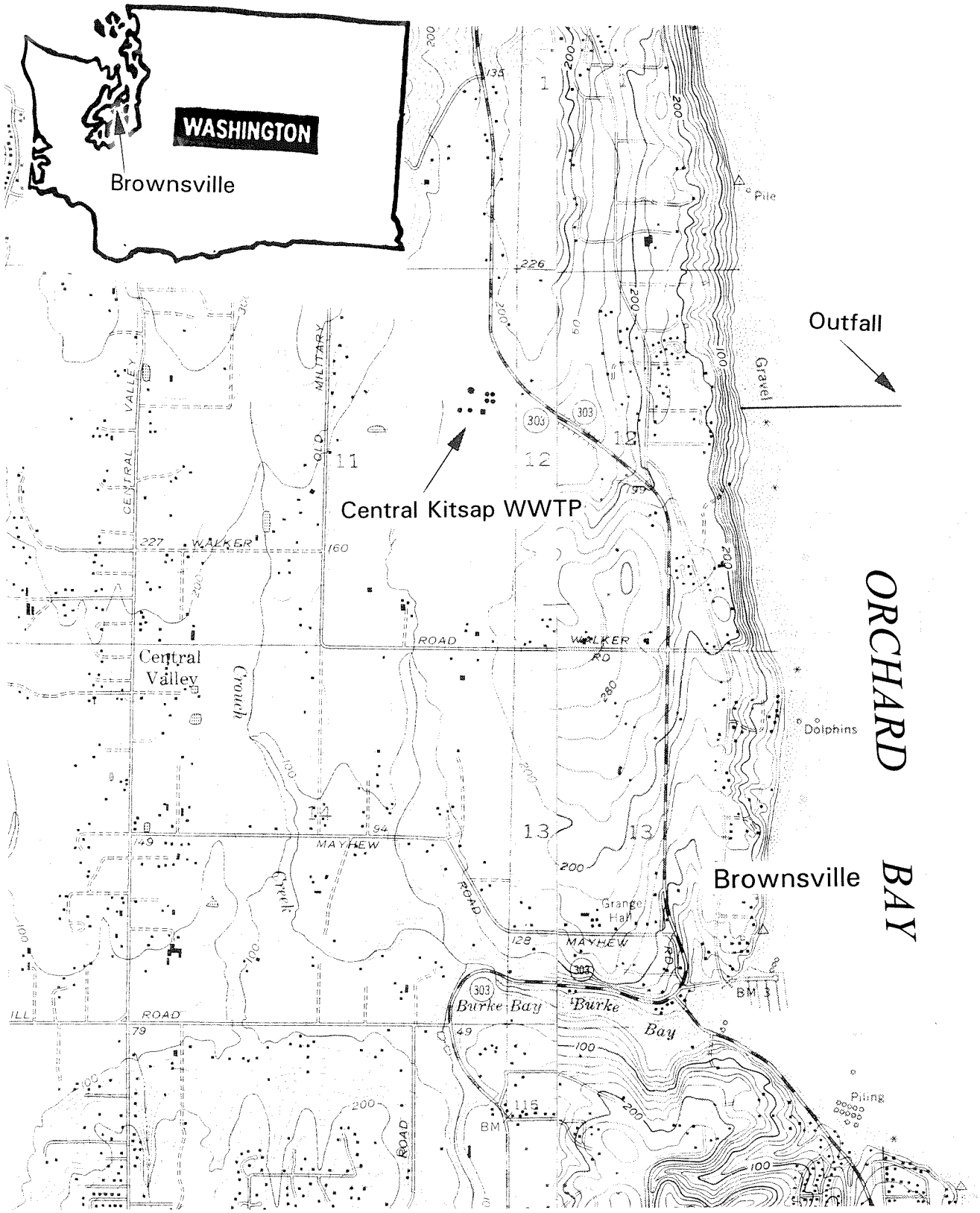

Figure 1 - Location Map - Central Kitsap WWTP, January 1998.

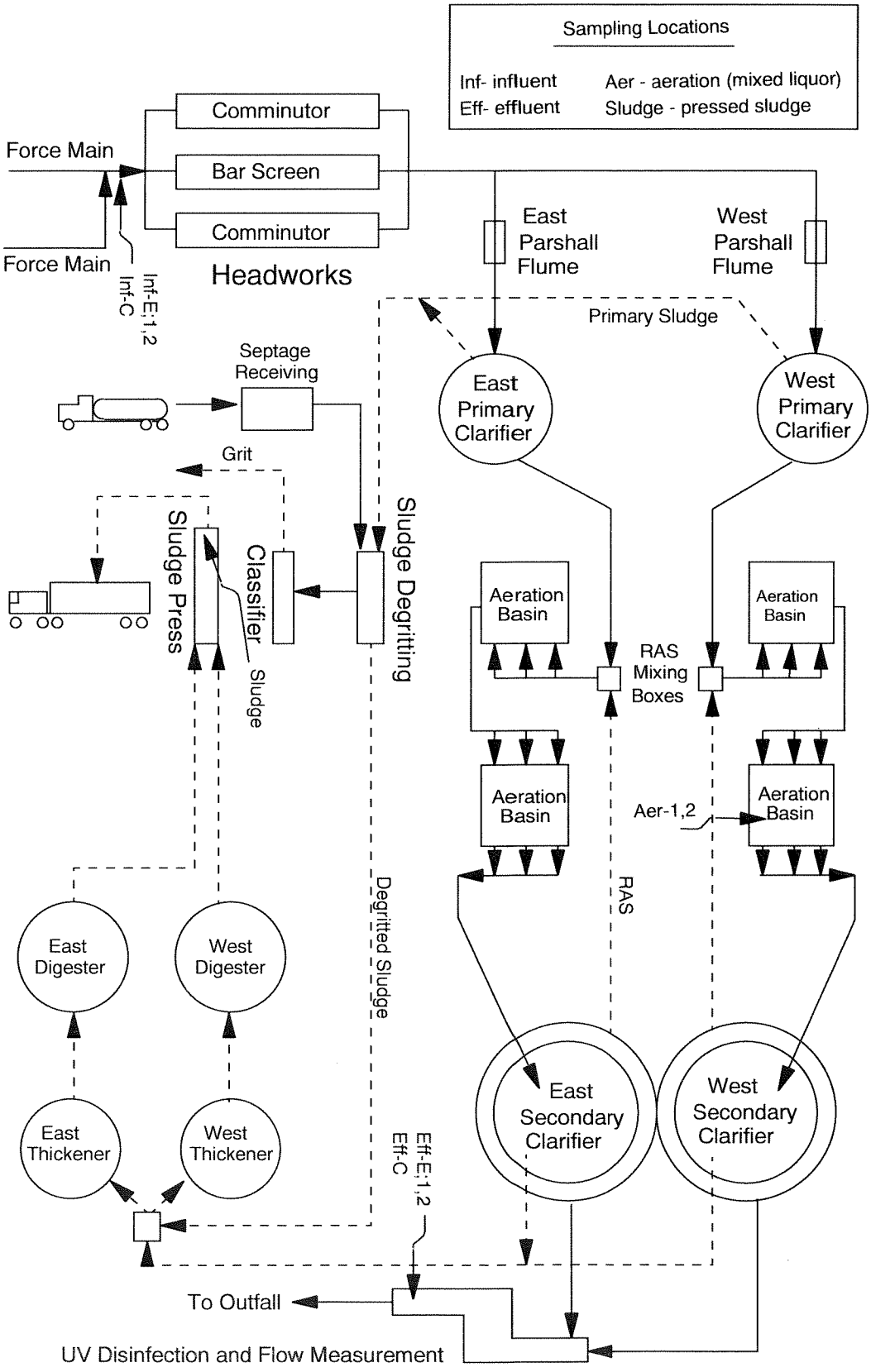

Figure 2 - Flow Schematic - Central Kitsap WWTP, January 1998.

Tables

Table 1 - General Chemistry Results - Central Kitsap WWTP, January 1998.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-C	Eff-1	Eff-2	Aer-1	Aer-2
	Type:	grab	grab	comp	comp	grab	grab	grab	grab
	Date:	1/27	1/27	1/27-28	1/27-28	1/27	1/27	1/27	1/27
	Time:	0915	1500	0800-0800	0800-0800	1030	1540	1130	1620
	Lab Log #:	058080	058081	058082	058083	058084	058085	058086	058087
GENERAL CHEMISTRY									
Conductivity		474	1030	618	577	446	467		
Alkalinity				192	164				
Hardness				102	96.5				
TS				551	593				
TNVS				220	242				
TSS		71	267	151	404	16	9	1930 J	2000 J
TNVSS				19 J	30			400 J	425 J
% Solids									
% Volatile Solids									
OXYGEN DEMAND PARAMETERS									
BOD5				156	162				
BODINH				122	133				
TOC (water)		37.6	59.4	56.5	54.2	11.5	11.0		
TOC (soil % dry wt)									
NUTRIENTS									
NH3-N		5.96	73	2.23	20.3	3.27	8.02		
NO2 + NO3-N		1.59	0.551	1.05	1.13	6.49	5.19		
Total-P		3.06	12.6	6.09	5.07	2.00	2.01		
MISCELLANEOUS									
F-Coliform MF (#/100mL)									
F-Coliform (#/100g-wet)									
Cyanide total (mg/L)									
Cyanide (wk & dis mg/L)									
Cobalt 60 (pCi/L)									
FIELD OBSERVATIONS									
Temperature (C)			13.9			11.0	12.2	12.9	12.1
Temp-cooled (C)				2.8	7.4				
pH			7.54			6.6	6.80	6.77	
Conductivity (umhos/cm)			1085	671	612	474	491	515	641
Chlorine									
Free							< 0.1		
Total							< 0.1		

E - Ecology sample
C - Central Kitsap sample
E - Ecology composite sample
C - Central Kitsap composite sample
Sludge - sludge
Sptg - septage

Table 1 - (cont'd) - Central Kitsap WWTP, January 1998.

Parameter II	Locat	Eff-E	Eff-C	Eff-3	Eff-4	Sptg-1	Sptg-2	Sludge	Bngr-1	Bngr-E	Kport-1	Kprt-E
Type:		comp	comp	grab	grab	grab	grab	grab	grab	comp	grab	comp
Date:		1/27-28	1/27-28	1/27	1/27	1/27	1/27	1/27	1/27	1/27-28	1/27	1/27-28
Time:		0800-0800	0800-0800	0840	1325	0900	1520	1100	1310	0800-0800	1355	0830-0830
Lab Log #:		058088	058089	058090	058091	058092	058093	058095	058096	058097	058098	058099
GENERAL CHEMISTRY												
Conductivity		499	502			2290	840		778	1490	564	484
Alkalinity		116	116									
Hardness		88.5	88.7									
TS		282	391			7450	11000		632	995	852	311
TNVS		192	131			2070	3300		338	716	218	162
TSS		7	9	7	7	3520 J	10600 J		114	103	283	53
TNVSS		2	2			640 J	3700 J		14	14	24	6
% Solids								16.5				
%Volatile Solids								11.5				
OXYGEN DEMAND PARAMETERS												
BOD5		8	10			3800	3000			121		62
BODINH		6	5									
TOC (water)		11.2	11.7			2410	2820		52.9	47.7	272	23.2
TOC (soil % dry wt)								32.8				
NUTRIENTS												
NH3-N		5.62	10.4									
NO2 + NO3-N		5.48	5.88									
Total-P		1.84	1.95									
MISCELLANEOUS												
F-Coliform MF (#/100mL)				3	6							
F-Coliform (#/100g-wet)								790,000				
Cyanide total (mg/L)											0.005 U	
Cyanide (wk & dis mg/L)											0.005 U	
Cobalt 60 (pCi/L)								0.145 U				
FIELD OBSERVATIONS												
Temperature (C)				11.7	12.7				13.4	2.1	15.4	2.0
Temp-cooled (C)		4.4	7.4									
pH				7.16					7.80		8.57	
Conductivity (umhos/cm)		541	534	570	570				805	2420	646	506
Chlorine												
Free				< 0.1							< 0.1	
Total				< 0.1							< 0.1	

Bngr - Bangor Sub Base

Keyprt - Navy Undersea Warfare Center

Table 2 - NPDES Permit Limits and Inspection Results - Central Kitsap WWTP, January 1998.

	NPDES Limits		Inspection Results	
Parameter	Monthly Average	Weekly Average	Composite Samples	Grab Samples
CBOD5	25 mg/L 1,251 lbs/day 85% removal	40 mg/L 2,001 lbs/day	6 mg/L 225 lbs/day* 95% removal	
TSS	30 mg/L 1,501 lbs/day 85% removal	45 mg/L 2,252 lbs/day	7 mg/L 263 lbs/day* 95% removal	
Fecal Coliform	200/100 mL	400/100 mL		3/100 mL 6/100 mL
pH	6.0 to 9.0 (continuous)			6.8

* based on totalizer reading of 4.497 MGD for 01-28-98.

Table 3 - Split Sample Results Comparison - Central Kitsap, January 1998.

	Location:	Inf-E	Inf-C	Eff-E	Eff-C
	Type:	comp	comp	comp	comp
	Date:	1/27-28	1/27-28	1/27-28	1/27-28
	Time:	0800-0800	0800-0800	0800-0800	0800-0800
	Lab Log #:	058082	058083	058088	058089
	Sampled by:	Ecology	C.K.	Ecology	C.K.
Parameter	Analysis by:				
BOD_5 (mg/L)	Ecology	156	162	8	10
	Central Kitsap	187	187	11	10
CBOD (mg/L) (BODINH)	Ecology	122	133	6	5
	Central Kitsap	181	181	10	6
TSS (mg/L)	Ecology	151	404	7	9
	Central Kitsap	190	144	8	13
Conductivity (uS/cm)	Ecology	618	577	499	502
	Central Kitsap	626	588	507	514

Inf - influent sample
Eff - effluent sample

E - Ecology sample
C - Central Kitsap sample
C.K. - Central Kitsap sample
comp - composite sample

Table 3 - (cont'd) - Central Kitsap, January 1998.

	Location:	Inf-E	Inf-C	Eff-E	Eff-C
	Type:	comp	comp	comp	comp
	Date:	1/27-28	1/27-28	1/27-28	1/27-28
	Time:	0800-0800	0800-0800	0800-0800	0800-0800
	Lab Log #:	058082	058083	058088	058089
	Sampled by:	Ecology	C.K.	Ecology	C.K.
Parameter	Analysis by:				
NH_3-N (mg/L)					
	Ecology	2.2	20.3	5.6	10.4
	Central Kitsap	24.8	19.2	12.7	13.5
TKN (mg/L)					
	Ecology	--	--	--	--
	Central Kitsap	33.1	29.0	12.6	13.4
NO_2-NO_3 (mg/L)					
	Ecology	1.0	1.1	5.5	5.9
	Central Kitsap	1.2	1.6	9.8	10.0

Inf - influent sample
Eff - effluent sample

E - Ecology sample
C - Central Kitsap sample
C.K. - Central Kitsap sample
comp - composite sample

Table 4 - Comparison of Organic Compounds and Metals Detected to Water Quality Criteria - Central Kitsap, January 1998.

	Location:	Inf-1	Inf-2	Eff-1	Eff-2	EPA/Ecology Water Quality Criteria Summary	
	Type:	grab	grab	grab	grab		
	Date:	1/27	1/27	1/27	1/27		
	Time:	0915	1500	1030	1540	Acute Marine	Chronic Marine
	Lab Log#:	058080	058081	058084	058085		
(Group)[1]	VOA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
a	Chloromethane	1	1 U	1 U	1 U	12,000 *(a)	6,400 *(a)
	Chloroethane	0.54 J	1 U	1 U	1 U		
	Acetone	72	4 U	4 U	4 U		
	2-Butanone (MEK)	2.9	2 U	2 U	2 U		
a	Chloroform	7	6	2.1	2.1	12,000 *(a)	6,400 *(a)
	1-Chlorobutane	0.12 J	1 U	1 U	1 U		
e	1,1-Dichloropropene	1 U	1 U	1 U	1 U	790 *(e)	
	Benzene	0.73 J	0.42 J	1 U	1 U	5,100 *	700 *
	Trichloroethene	0.34 J	0.47 J	1 U	1 U	2,000 *	
a	Bromodichloromethane	0.74 J	0.49 J	1 U	1 U	12,000 *(a)	6,400 *(a)
	4-Methyl-2-Pentanone (MIBK)	2 U	0.33 J	2 U	2 U		
	Toluene	3.1	4.4	0.11 J	1 U	6,300 *	5,000 *
e	trans-1,3-Dichloropropene	0.94 U	0.94 U	0.94 U	0.94 U	790 *(e)	
	Tetrachloroethene	1 U	0.41 J	1 U	1 U	10,200 *	450 *
	Ethylbenzene	0.34 J	0.32 J	1 U	1 U	430 *	
	m&p-Xylene	1.2 J	1.3 J	2 U	2 U		
	o-Xylene	0.5 J	0.56 J	1 U	1 U		
	n-Propylbenzene	1 U	0.07 J	1 U	1 U		
	1,3,5-Trimethylbenzene	0.2 J	0.37 J	1 U	1 U		
	1,2,4-Trimethylbenzene	0.7 J	1.2	1 U	1 U		
	p-Isopropyltoluene	1.3	1.2	1 U	1 U		
h	1,4-Dichlorobenzene	1.2	1.7	0.56 J	0.55 J	1,970 *(h)	

inf - influent sample
eff - effluent sample
grab - grab sample

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

Table 4 - (cont'd) - Central Kitsap, January 1998.

	Location:	Inf-E	Eff-E	EPA/Ecology Water Quality Criteria Summary	
	Type:	comp	comp		
	Date:	1/27-28	1/27-28	Acute	Chronic
	Time:	0800-0800	0800-0800	Marine	Marine
	Lab Log#:	058082	058088		
	BNA Compounds	(ug/L)	(ug/L)	(ug/L)	(ug/L)
(Group)[1]					
	Phenol	**1.4 J**	0.13 UJ	5,800 *	
	4-Methylphenol	**11 J**	**0.04 J**		
	Benzoic Acid	**23 J**	**0.64 J**		
	2,4-Dichlorophenol	0.53 UJ	**0.059 J**		
n	Naphthalene	**0.17 J**	**0.0081 J**	2,350 *	
	2-Methylnaphthalene	**0.14 J**	**0.0052 J**		
	1-Methylnaphthalene	**0.094 J**	**0.0027 J**		
n	Acenaphthylene	**0.2 J**	0.13 UJ	300 *(n)	
i	Diethyl Phthalate	**3.2 J**	**0.14 J**	2.944 *(i)	3.4 *(i)
n	Fluorene	**0.023 J**	0.13 UJ	300 *(n)	
n	Phenanthrene	**0.051 J**	0.13 UJ	300 *(n)	
	Caffeine	**13 J**	**0.057 J**		
i	Di-n-Butyl Phthalate	**0.95**	**0.067 J**	*(i) 2.944 *(i)	3.4 *(i)
i	Butylbenzyl Phthalate	**2 J**	**0.041 J**	*(i) 2.944 *(i)	3.4 *(i)
i	Bis(2-Ethylhexyl)Phthalate	**8.2 J**	**0.31 J**	*(i) 2.944 *(i)	3.4 *(i)
	3B-Coprostanol	**32 J**	**2.4 J**		

Table 4 - (cont'd) - Central Kitsap, January 1998.

	Location:	Bngr-1		Kport-1		EPA/Ecology Water Quality Criteria Summary			
	Type:	grab		grab					
	Date:	35822		35822		Acute		Chronic	
	Time:	1300		1355		Marine		Marine	
	Lab Log#:	58096		58098					
	VOA Compounds	(ug/L)		(ug/L)		(ug/L)		(ug/L)	
(Group)[1]									
	Acetone	**84**		**244**	**E**				
	2-Butanone (MEK)	2	U	**3.7**					
b	cis-1,2-Dichloroethene	1	U	**1.4**		12,000	*(a)	6,400	*(a)
a	Chloroform	**2.7**		**2.5**					
	Trichloroethene	1	U	**53**		2,000	*		
a	Bromodichloromethane	**0.25**	**J**	**0.64**	**J**	12,000	*(a)	6,400	*(a)
	4-Methyl-2-Pentanone (MIBK)	**0.48**	**J**	**0.28**	**J**				
	2-Hexanone	2	U	**2.2**		790	*(e)		
a	Dibromochloromethane	**0.84**	**J**	**0.82**	**J**	10,200	*	450	*
	Chlorobenzene	1	U	**0.36**	**J**	430	*		
	m&p-Xylene	**0.22**	**J**	2	U				
	o-Xylene	**0.15**	**J**	1	U				
	p-Isopropyltoluene	**2.4**		**0.31**	**J**				
h	1,4-Dichlorobenzene	**2.2**		**0.62**	**J**	1,970	*(h)		

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the associated estimated value.

E - Reported result is an estimate because of the presence of interference.

grab - grab sample
Bngr - Naval Submarine Base Bangor
Kport - Naval Undersea Warfare Engineering Station at Keyport

Table 4 - (cont'd) - Central Kitsap, January 1997.

Location:	Inf-E	Eff-E	Trnsblk	Bngr-E	Kport-E	EPA/Ecology Water Quality Criteria	
Type:	comp	comp	grab	comp	comp		
Date:	1/27-28	1/27-28	1/26	1/27-28	1/27-28	Acute	Chronic
Time:	0800-0800	0800-0800	1145	0800-0800	0830-0830	Marine	Marine
Lab Log#:	058082	058088	058100	058097	058099		
	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Metals (total recoverable)							
Antimony	1 U	1 U	1 U	1 U	1 U		
Arsenic	**2.5**	**2.2**	1 U	1.5	1 U		
Pentavalent						2,319	13
Trivalent						69	36
Beryllium	1 U	1 U	1 U	1 U	1 U		
Cadmium	**0.30**	0.1 U	0.1 U	0.1 U	**0.51**	42.0	9.3
Chromium	2.3	1 U	1 U	1.8	3.2		
Hexavalent						1,100	50
Trivalent						10,300	
Copper	40.7	12.4	1 U	53.0	38.1	4.80	3.10
Lead	3.0	1 U	1 U	2.7	3.7	210	8.1
Mercury (total)	**0.19**	0.05 U	0.05 U	**0.14**	0.05 U	1.8	0.025
Nickel	5.4	4.0	1 U	13.4	10.7	74	8.2
Selenium	1 U	1 U	1 U	2.6	1 U	290	71
Silver	**3.8**	**0.45**	0.2 U	**0.95**	**0.36**	1.9	
Thallium	1 U	1 U	1 U	1 U	1 U	2,130 *	
Tin					5 UJ		
Zinc	**81.5**	**56.0**	**2.2**	**76.3**	**90.8**	90	81

Eff - Effluent
E - Ecology sample
Trnsblk - transfer blank
Bngr-E - Naval Subbase Bangor effluent sample
Kport-E - Keyport Station

Bold -detected value

U - The analyte was not detected at or above the reported result.
UJ - undetected at estimated detection level

Table 5 - Sludge Metals and Comparison with EPA Criteria for Land Application - Central Kitsap, January 1998.

Location:	Sludge		
Type:	grab	EPA Sludge	
Date:	01/27	Application Limits	EPA Ceiling
Time:	1100	(monthly avg.)	Concentrations
Lab Log #:	058095		
	mg/Kg-dry	mg/Kg-dry	mg/Kg-dry
Metals (total)			
Antimony	3 UJ		
Arsenic	3.17 J	41	75
Beryllium	0.17		
Cadmium	2.4	39	85
Chromium	28.9	1200	3000
Copper	374	1500	4300
Lead	27	300	840
Mercury	2.56	17	57
Nickel	23.5	420	420
Selenium	5.91 J	36	100
Silver	37.9		
Thallium	0.3 UJ		
Zinc	630	2800	7500

Sludge - sludge sample
Compost - compost sample

grab - grab sample

J - The analyte was positively identified. The associated numerical result is an estimate.
UJ - The analyte was undetected at estimated detection level.

Appendices

Appendix A - Sampling Station Descriptions - Central Kitsap, January 1998.

Ecology influent grab and composite samples (Inf-1,2; Inf-E)

The influent grab and composite samples were taken from the influent box upstream of the degritter. The compositor intake was placed without a strainer, with the intake facing downstream to prevent the collection of rags on the intake.

Central Kitsap influent composite sample (Inf-C)

The influent composite sample was taken from a strainer suspended in the influent box upstream of the degritter.

Ecology effluent grab and composite samples (Eff-1,2; Eff-E)

Effluent grab and composite samples were taken downstream of the weir above which the two effluent streams are mixed together. The strainer was placed approximately 3 inches below the water surface. The depth at the sampling location was about 10 feet.

Central Kitsap effluent composite sample (Eff-C)

The effluent composite sample was taken downstream of the weir above which the two effluent streams are mixed together. The strainer was placed approximately 3 inches below the water surface. The depth at the sampling location was about 10 feet.

Ecology aeration basin grab samples (Aer-1,2)

The aeration basin (mixed liquor) sample was taken from the West Basin in a well-mixed region.

Ecology Bangor wastewater grab and composite samples (Bngr-1; Bngr-E)

Influent grab and composite samples were collected downstream of the Parshall flume. The intake was placed on the bottom of the channel. The rapid flow prevented sediment from being deposited on the channel bottom.

Ecology Keyport wastewater grab and composite samples (Kport-1; Kport-E)

The intake strainer was placed resting on the bottom of the 3-inch Parshall flume. The flow was sufficient at the time of setup to just cover the strainer.

Ecology sludge sample (Sludge)

The sludge sample was collected from the open filter press.

Ecology septage samples (Sptg-1; Sptg-2)

Septage samples were collected from trucks discharging septage into the plant. Sptg-1 was collected as a grab composite with 1/3 of the sample from trucks delivering Suquamish, Manchester, and Kingston septage. Sptg-2 was collected as a grab composite from two trucks delivering private septage.

Appendix B - Sampling Procedures - Central Kitsap, January 1998.

Ecology Isco composite samplers were set up to collect equal volumes of sample every 30 minutes for 24 hours. The samples were then divided into subsamples for analysis. The compositors were iced to preserve samples.

The composite influent and effluent samplers operated by Central Kitsap were set to collect equal volumes of sample every 20 minutes for 24 hours. The samples were kept refrigerated during sampling.

Ecology influent and effluent composite samples and Central Kitsap influent and effluent composite samples were split for both Ecology and Central Kitsap laboratory analysis. Sampler configurations and locations are summarized in Figure 2 and Table 1.

Appendix C - CLASS II INSPECTION Lab Needs Estimate - Central Kitsap WWTP, January 1998.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-C	Eff-1	Eff-2	Aer-1	Aer-2
	Type:	grab	grab	comp	comp	grab	grab	grab	grab
	Date:	1/27	1/27	1/27-28	1/27-28	1/27	1/27	1/27	1/27
	Time:	0915	1500	0800-0800	0800-0800	1030	1540	1130	1620
	Lab Log #:	058080	058081	058082	058083	058084	058085	058086	058087
GENERAL CHEMISTRY									
Conductivity		E	E	E	E	E	E		
Alkalinity				E	E				
Hardness				E	E				
TS				E	E				
TNVS				E	E				
TSS		E	E	EC	EC	E	E	E	E
TNVSS				E	E			E	E
% Solids									
% Volatile Solids									
BOD5				E	E				
BODINH				EC	EC				
TOC (water)		E	E	E	E	E	E		
TOC (soil % dry wt)					E				
NH3-N		E	E	E	E	E	E		
NO2+NO3-N		E	E	E	E	E	E		
Total-P		E	E	E	E	E	E		
F-Coliform MF (#/100mL)									
F-Coliform (#/100g-wet)									
Cyanide total (mg/L)									
Cyanide (wk & dis mg/L)									
VOC (water)		E	E			E	E		
VOC (wtr - spk, dup)						E			
BNAs (water)				E					
BNA (wtr - spk, dup)									
PP Metals (water)				E					
PP Mtls (wtr - spk, dup)									
Tin (water)									
PP Metals (soils)									
Cobalt 60									

-E - Ecology sample
-C - Central Kitsap sample
E - Ecology analysis
C - Central Kitsap analysis

U - The analyte was not detected at or above the reported result.
J - The associated numerical result is an estimate.

Sludge - sludge
Sptg - septage

Bngr - Bangor Sub Base
Keyprt - Navy Undersea Warfare Center

Appendix C - (cont'd) - Central Kitsap WWTP, January 1998.

Parameter II	Locat	Eff-E	Eff-C	Eff-3	Eff-4	Sptg-1	Sptg-2	Sludge	Bngr-1	Bngr-E	Kport-1	Kprt-E
Type:		comp	comp	grab	grab	grab	grab	grab	grab	comp	grab	comp
Date:		1/27-28	1/27-28	1/27	1/27	1/27	1/27	1/27	1/27	1/27-28	1/27	1/27-28
Time:		0800-0800	0800-0800	0840	1325	0900	1520	1100	1310	0800-0800	1355	0830-0830
Lab Log #:		058088	058089	058090	058091	058092	058093	058095	058096	058097	058098	058099
GENERAL CHEMISTRY												
Conductivity		E	E			E	E		E	E	E	E
Alkalinity		E	E									
Hardness		E	E									
TS		E	E			E	E		E	E	E	E
TNVS		E	E			E	E		E	E	E	E
TSS		EC	EC	E	E	E	E		E	E	E	E
TNVSS		E	E			E	E		E	E	E	E
% Solids								E				
%Volatile Solids								E				
BOD5		E	E			E	E			E		E
BODINH		EC	EC									
TOC (water)		E	E			E	E		E	E	E	E
TOC (soil % dry wt)								E				
NH3-N		E	E									
NO2+NO3-N		E	E									
Total-P		E	E									
F-Coliform MF (#/100mL)				E	E							
F-Coliform (#/100g-wet)								E				
Cyanide total (mg/L)											E	
Cyanide (wk & dis mg/L)											E	
VOC (water)									E		E	
VOC (wtr - spk, dup)												
BNAs (water)		E										
BNA (wtr - spk, dup)		E										
PP Metals (water)		E								E		E
PP Metals (wtr - spk, dup		E										
Tin (water)												E
PP Metals (soils)								E				
Cobalt 60								E				

Appendix D - Ecology Analytical Methods - Central Kitsap, January 1998.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
Conductivity	EPA, Revised 1983: 120.1	Manchester Laboratory
Alkalinity	EPA, Revised 1983: 310.1	Manchester Laboratory
Hardness	EPA, Revised 1983: 130.2	Manchester Laboratory
TS	EPA, Revised 1983: 160.3	Manchester Laboratory
TNVS	EPA, Revised 1983: 160.3	Manchester Laboratory
TSS	EPA, Revised 1983: 160.2	Manchester Laboratory
TNVSS	EPA, Revised 1983: 160.2	Manchester Laboratory
% Solids	APHA, 1992: 2540G.	Manchester Laboratory
% Volatile Solids	EPA, Revised 1983: 160.4	Manchester Laboratory
BOD5	EPA, Revised 1983: 405.1	Manchester Laboratory
BOD INH	EPA, Revised 1983: 405.1	Manchester Laboratory
TOC (water)	EPA, Revised 1983: 415.1	Manchester Laboratory
TOC (soil/sed)	EPA, Revised 1983: 415.1	Manchester Laboratory
NH3-N	EPA, Revised 1983: 350.1	Manchester Laboratory
NO2+NO3-N	EPA, Revised 1983: 353.2	Manchester Laboratory
Total-P	EPA, Revised 1983: 365.3	Manchester Laboratory
F-Coliform MF	APHA, 1992: 9222D.	Manchester Laboratory
F-Coliform (soil/sed)	APHA, 1989: 9221A.	Manchester Laboratory
Cyanide (total)	EPA, Revised 1983: 335.2.	Manchester Laboratory
Cyanide (wk & dis)	APHA, 1992: 4500 CNI.	Manchester Laboratory
VOC (water)	EPA, 1986: 8260	Manchester Laboratory
BNAs (water)	EPA, 1986: 8270	Manchester Laboratory
PP Metals (water)	EPA, Revised 1983: 200-299	Manchester Laboratory
PP Metals (soil/sed)	EPA, Revised 1983: 200-299	Manchester Laboratory
Cobalt 60		Quanterra Environmental Services

METHOD BIBLIOGRAPHY

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EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (Rev. March, 1983).

EPA, 1986: SW846. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, 3rd. ed.,November, 1986.

Appendix E - Quality Assurance/Quality Control (QA/QC) - Central Kitsap, January 1997.

SAMPLING QA/QC

Ecology quality assurance procedures for sampling included cleaning of the sampling equipment for priority pollutant metals analyses prior to the inspection to prevent sample contamination (Appendix E). Chain-of-custody procedures were followed to assure the security of the samples (Ecology, 1994).

LABORATORY QA/QC

General Chemistry Analyses

The data generated can be used noting certain data qualifications. Some TSS and TNVSS values were qualified with a "J" (estimate) because the matrix allowed less than 5 mLs of sample to be used for the analysis. The lack of a representative portion of sample for analysis resulted in reduced confidence in the sample results.

The samples were received in good condition. All analyses were performed within applicable EPA holding times. Instrument calibration was performed before each analysis and verified by initial and verification standards and blanks. All initial and continuing verification standards were within the relevant EPA control limits. All procedural blanks were within acceptable limits. All spike recoveries were within the acceptance window of +/- 25%. The results of duplicate analyses were within their acceptance windows of +/- 20% except for TNVSS lab log # 958082. The duplicate was not within the acceptance windows of +/- 40% for Fecal coliform - MF. Laboratory control sample (LCS) analyses were within their acceptance windows of +/- 20%.

Ammonia samples Inf-E and Inf-C differed by a factor of 10 while Eff-E and Eff-C differed by a factor of almost 2. The analyst had analyzed these samples more than once with similar results.

Organic Analyses

Low levels of certain target compounds were found in the volatile organic analysis (VOA) laboratory blanks. The EPA five times rule was applied to all target compounds which were found in the blank. If the on-column concentrations of compounds in a sample are at least five times greater than the on-column concentrations of the same compounds detected in the associated method blank, they are considered native to the sample. Surrogate recoveries were within acceptable limits for all samples. The samples were analyzed within the recommended 14 day holding time. All matrix spike recoveries were within acceptable limits.

Some problems were encountered during the semivolatile organics (BNA) sample extractions due to the formation of emulsions with the methylene chloride. Low levels of some target

compounds were detected in the laboratory blanks. The EPA five times rule was applied to all target compounds which were found in the blank. Surrogate recoveries were within acceptable limits except for 2-fluorobiphenyl where it was just below the limit. Matrix spike recoveries for sample 058088 were low. Due to the low surrogate recoveries in sample 058082 most of the data was "J" qualified. The later eluting compounds were not qualified since their surrogates were within acceptable limits.

Metals Analyses

Data quality for water samples met quality assurance objectives with the exception that recovery of tin was low from spiked samples and marginally low from the LCS sample. No other significant quality assurance issues were noted with the data. All initial and CCV standards, except some for silver and beryllium, were within the relevant USEPA (CLP) control limits. Silver CCV for total metals data was marginal, 89% recovery. Other silver QC was acceptable and the data was not qualified. Beryllium CCV standard drifted high at the end of one analysis sequence. Affected samples did not show detectable beryllium and were not qualified. All spike recoveries, except those for tin, were within the CLP acceptance limits of +/- 25%. Tin data was qualified UJ, as undetected at the estimated detection level, due to low (10% and 6%) spike recoveries.

Data quality for solids samples met quality assurance objectives with the exception that recoveries of arsenic, antimony, selenium, and thallium were low from spiked samples and antimony recovery was low from the LCS sample. No other significant quality assurance issues were noted with the data. All spike recoveries, except those for arsenic, antimony, selenium, and thallium were within the CLP acceptance limits of +/- 25%. Antimony and thallium data are qualified UJ, as undetected at the estimated detection level due to low recoveries (49% and 58% for antimony - 28% and 20% for thallium). Arsenic and selenium data were qualified J as estimated, due to low recovery (58% and 55% for arsenic - 69% and 66% for selenium). Results for copper and mercury spikes were reported NC, as not calculated, since spike levels were less than one forth the sample level.

LABORATORY AUDIT

The Central Kitsap laboratory was accredited on August 20, 1991 and renewed most recently on December 22, 1997. It expires on November 15, 1998.

Appendix F - Priority Pollutant Metals Cleaning Procedures – Central Kitsap, January 1988.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent (phosphate-free)
2. Rinse several times with tap water
3. Rinse with 10% HNO_3 solution
4. Rinse three times with distilled/deionized water
5. Rinse with high purity acetone
6. Rinse with high purity hexane
7. Allow to dry and seal with aluminum foil

Appendix G - VOA, BNA, and Metals Scan Results - Central Kitsap - January, 1998.

	Location:	Inf-1	Inf-2	Eff-1	Eff-2
	Type:	grab	grab	grab	grab
	Date:	1/27	1/27	1/27	1/27
	Time:	0915	1500	1030	1540
	Lab Log#:	058080	058081	058084	058085
(Group)[1]	VOA Compounds	ug/L	ug/L	ug/L	ug/L
a	Dichlorodifluoromethane	2 U	2 U	2 U	2 U
a	Chloromethane	**1**	1 U	1 U	1 U
	Vinyl Chloride	1 U	1 U	1 U	1 U
a	Bromomethane	1 U	1 U	1 U	1 U
	Chloroethane	**0.54 J**	1 U	1 U	1 U
a	Trichlorofluoromethane	1 U	1 U	1 U	1 U
	Ethyl Ether	1 U	1 U	1 U	1 U
	1,1,2 Trichlorotrifluoroethane	1 U	1 U	1 U	1 U
b	1,1-Dichloroethene	1 U	1 U	1 U	1 U
	Acetone	**72**	4 U	4 U	4 U
	Methyl Iodide	1 U	1 U	1 U	1 U
	Carbon Disulfide	2 U	2 U	2 U	2 U
	Allyl Chloride	1 U	1 U	1 U	1 U
a	Methylene Chloride	1 U	1 U	1 U	1 U
	Acrylonitrile	5 U	5 U	5 U	5 U
	2-Methyoxy-2-Methylpropane	1 U	1 U	1 U	1 U
b	trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U
	1,1-Dichloroethane	1 U	1 U	1 U	1 U
	2-Butanone (MEK)	**2.9**	2 U	2 U	2 U
b	cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U
d	2,2-Dichloropropane	1 U	1 U	1 U	1 U
	Methyl acrylate	1 U	1 U	1 U	1 U
	Methyacrilonitrile	1 U	1 U	1 U	1 U
a	Bromochloromethane	1 U	1 U	1 U	1 U
a	Chloroform	**7**	**6**	**2.1**	**2.1**
	Tetrahydrofuran	2 U	2 U	2 U	2 U
c	1,1,1-Trichloroethane	1 U	1 U	1 U	1 U
	1-Chlorobutane	**0.12 J**	1 U	1 U	1 U
e	1,1-Dichloropropene	1 U	1 U	1 U	1 U
a	Carbon Tetrachloride	1 U	1 U	1 U	1 U
	1,2-Dichloroethane	1 U	1 U	1 U	1 U
	Benzene	**0.73 J**	**0.42 J**	1 U	1 U
	Trichloroethene	**0.34 J**	**0.47 J**	1 U	1 U
d	1,2-Dichloropropane	1 U	1 U	1 U	1 U
	Methyl Methacrylate	1 U	1 U	1 U	1 U
a	Dibromomethane	1 U	1 U	1 U	1 U
a	Bromodichloromethane	**0.74 J**	**0.49 J**	1 U	1 U
	2-Nitropropane	1 U	1 U	1 U	1 U
	Chloroacetonitrile	5 U	5 U	5 U	5 U
e	cis-1,3-Dichloropropene	1.1 U	1.1 U	1.1 U	1.1 U
	4-Methyl-2-Pentanone (MIBK)	2 U	**0.33 J**	2 U	2 U
	1,1-Dichloropropanone	2 U	1 U	1 U	1 U
	Toluene	**3.1**	**4.4**	**0.11 J**	1 U
e	trans-1,3-Dichloropropene	0.94 U	0.94 U	0.94 U	0.94 U
	Ethylmethacrylate	1 U	1 U	1 U	1 U
c	1,1,2-Trichloroethane	1 U	1 U	1 U	1 U

Appendix G - (cont'd) - Central Kitsap, January 1998.

	Location:	Inf-1	Inf-2	Eff-1	Eff-2
	Type:	grab	grab	grab	grab
	Date:	1/27	1/27	1/27	1/27
	Time:	0915	1500	1030	1540
	Lab Log#:	058080	058081	058084	058085
(Group)[1]	VOA Compounds (cont'd)	ug/L	ug/L	ug/L	ug/L
d	1,3-Dichloropropane	1 U	1 U	1 U	1 U
	2-Hexanone	2 U	2 U	2 U	2 U
	Tetrachloroethene	1 U	0.41 J	1 U	1 U
a	Dibromochloromethane	1 U	1 U	1 U	1 U
	1,2-Dibromoethane (EDB)	1 U	1 U	1 U	1 U
g	Chlorobenzene	1 U	1 U	1 U	1 U
f	1,1,1,2-Tetrachloroethane	1 U	1 U	1 U	1 U
	Ethylbenzene	0.34 J	0.32 J	1 U	1 U
	m&p-Xylene	1.2 J	1.3 J	2 U	2 U
	o-Xylene	0.5 J	0.56 J	1 U	1 U
	Styrene (Ethenylbenzene)	1 U	1 U	1 U	1 U
a	Bromoform	1 U	1 U	1 U	1 U
	Isopropylbenzene	1 U	1 U	1 U	1 U
f	1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U
	Trans-1,4-Dichloro-2-butene	1 U	1 U	1 U	1 U
	1,2,3-Trichloropropane	1 U	1 U	1 U	1 U
	Bromobenzene	1 U	1 U	1 U	1 U
	n-Propylbenzene	1 U	0.07 J	1 U	1 U
	2-Chlorotoluene	1 U	1 U	1 U	1 U
	1,3,5-Trimethylbenzene	0.2 J	0.37 J	1 U	1 U
	4-Chlorotoluene	1 U	1 U	1 U	1 U
	tert-Butylbenzene	1 U	1 U	1 U	1 U
	1,2,4-Trimethylbenzene	0.7 J	1.2	1 U	1 U
	Pentachloroethane	1 U	1 U	1 U	1 U
	sec-Butylbenzene	1 U	1 U	1 U	1 U
	p-Isopropyltoluene	1.3	1.2	1 U	1 U
h	1,3-Dichlorobenzene	1 U	1 U	1 U	1 U
h	1,4-Dichlorobenzene	1.2	1.7	0.56 J	0.55 J
	n-Butylbenzene	1 U	1 U	1 U	1 U
h	1,2-Dichlorobenzene	1 U	1 U	1 U	1 U
	Hexachloroethane	1 U	1 U	1 U	1 U
	1,2-Dibromo-3-Chloropropane	1 U	1 U	1 U	1 U
	1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U
	Hexachlorobutadiene	1 U	1 U	1 U	1 U
	Naphthalene	1 U	1 U	1 U	1 U
	1,2,3-Trichlorobenzene	1 U	1 U	1 U	1 U

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the associated estimated value.

Inf - influent sample
Eff - effluent sample
grab - grab sample

Appendix G - (cont'd) - Central Kitsap, January 1998.

	Location:	Inf-E	Eff-E
	Type:	comp	comp
	Date:	1/27-28	1/27-28
	Time:	0800-0800	0800-0800
	Lab Log#:	058082	058088
	BNA Compounds		
(Group)[1]			
	N-Nitrosodimethylamine	1.3 UJ	0.26 UJ
	Pyridine	1.3 UJ	0.52 UJ
	Aniline	0.27 UJ	0.13 UJ
	Phenol	**1.4 J**	0.13 UJ
j	Bis(2-Chloroethyl)Ether	0.27 UJ	0.13 UJ
	2-Chlorophenol	0.27 UJ	0.13 UJ
h	1,3-Dichlorobenzene	0.27 UJ	0.13 UJ
h	1,4-Dichlorobenzene	0.27 UJ	0.13 UJ
h	1,2-Dichlorobenzene	0.27 UJ	0.13 UJ
	Benzyl Alcohol	0.27 UJ	0.13 UJ
	2-Methylphenol	0.27 UJ	0.13 UJ
	2,2'-Oxybis[1-chloropropane]	0.27 UJ	0.13 UJ
k	N-Nitroso-di-n-Propylamine	0.27 UJ	0.13 UJ
	4-Methylphenol	**11 J**	**0.04 J**
	Hexachloroethane	0.27 UJ	0.13 UJ
	Nitrobenzene	0.27 UJ	0.13 UJ
	Isophorone	0.27 UJ	0.13 UJ
l	2-Nitrophenol	2.7 UJ	1.3 UJ
	2,4-Dimethylphenol	0.27 UJ	0.13 UJ
j	Bis(2-Chloroethoxy)Methane	0.27 UJ	0.13 UJ
	Benzoic Acid	**23 J**	**0.64 J**
	2,4-Dichlorophenol	0.53 UJ	**0.059 J**
g	1,2,4-Trichlorobenzene	0.27 UJ	0.13 UJ
n	Naphthalene	**0.17 J**	**0.0081 J**
	4-Chloroaniline	0.27 UJ	0.13 UJ
	Hexachlorobutadiene	0.27 UJ	0.13 UJ
	4-Chloro-3-Methylphenol	0.53 UJ	0.26 UJ
	2-Methylnaphthalene	**0.14 J**	**0.0052 J**
	1-Methylnaphthalene	**0.094 J**	**0.0027 J**
	Hexachlorocyclopentadiene	2.7 UJ	1.3 UJ
	2,4,6-Trichlorophenol	0.53 UJ	0.26 UJ
	2,4,5-Trichlorophenol	0.27 UJ	0.13 UJ
m	2-Chloronaphthalene	0.27 UJ	0.13 UJ
	2-Nitroaniline	1.3 UJ	0.66 UJ
i	Dimethyl Phthalate	1.3 UJ	0.66 UJ
o	2,6-Dinitrotoluene	1.3 UJ	0.66 UJ
n	Acenaphthylene	**0.2 J**	0.13 UJ
	3-Nitroaniline	1.3 UJ	0.66 UJ
n	Acenaphthene	0.27 UJ	0.13 UJ
l	2,4-Dinitrophenol	5.3 UJ	2.6 UJ
l	4-Nitrophenol	1.3 UJ	0.66 UJ
	Dibenzofuran	0.27 UJ	0.13 UJ
o	2,4-Dinitrotoluene	1.3 UJ	0.66 UJ
i	Diethyl Phthalate	**3.2 J**	**0.14 J**
n	Fluorene	**0.023 J**	0.13 UJ
p	4-Chlorophenyl Phenylether	0.27 UJ	0.13 UJ
	4-Nitroaniline	0.53 UJ	0.26 UJ

Appendix G - (cont'd) - Central Kitsap, January 1998.

	Location:	Inf-E	Eff-E
	Type:	comp	comp
	Date:	1/27-28	1/27-28
	Time:	0800-0800	0800-0800
	Lab Log#:	058082	058088
	BNA Compounds (cont'd)		
(Group)[1]			
l	4,6-Dinitro-2-Methylphenol	1.3 UJ	0.66 UJ
k	N-Nitrosodiphenylamine	0.27 UJ	0.13 UJ
	Hydrazine, 1,2-Diphenyl-	0.27 UJ	0.13 UJ
p	4-Bromophenyl Phenylether	0.27 UJ	0.13 UJ
g	Hexachlorobenzene	0.27 UJ	0.13 UJ
	Pentachlorophenol	2.7 UJ	1.3 UJ
n	Phenanthrene	**0.051 J**	0.13 UJ
n	Anthracene	0.27 U	0.13 UJ
	Caffeine	**13 J**	**0.057 J**
	Carbazole	0.27 U	0.13 UJ
i	Di-n-Butyl Phthalate	**0.95**	**0.067 J**
n	Fluoranthene	0.27 U	0.13 UJ
	Benzidine	1.3 UJ	0.66 UJ
n	Pyrene	0.27 U	0.13 UJ
	Retene	0.27 U	0.13 UJ
i	Butylbenzyl Phthalate	**2 J**	**0.041 J**
n	Benzo(a)Anthracene	0.27 U	0.13 UJ
	3,3'-Dichlorobenzidine	0.53 UJ	0.26 UJ
n	Chrysene	0.27 U	0.13 UJ
i	Bis(2-Ethylhexyl)Phthalate	**8.2 J**	**0.31 J**
i	Di-n-Octyl Phthalate	0.53 UJ	0.26 UJ
n	Benzo(b)Fluoranthene	1.3 U	0.66 UJ
n	Benzo(k)Fluoranthene	0.27 U	0.13 UJ
n	Benzo(a)Pyrene	0.27 U	0.13 UJ
	3B-Coprostanol	**32 J**	**2.4 J**
n	Indeno(1,2,3-cd)Pyrene	0.53 U	0.26 UJ
n	Dibenzo(a,h)Anthracene	0.53 U	0.26 UJ
n	Benzo(g,h,i)Perylene	1.3 U	0.66 UJ

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the associated estimated value.

E-comp - Ecology composite sample

grab - grab sample

comp - composite sample

Inf - influent

Eff- final effluent

Appendix G - (cont'd) - Central Kitsap - January, 1998.

		Location:	Bngr-1	Kport-1
		Type:	grab	grab
		Date:	1/27	1/27
		Time:	1300	1355
		Lab Log#:	058096	058098
	VOA Compounds		ug/L	ug/L
(Group)[1]				
a	Dichlorodifluoromethane		2 U	2 U
a	Chloromethane		1 U	1 U
	Vinyl Chloride		1 U	1 U
a	Bromomethane		1 U	1 U
	Chloroethane		1 U	1 U
a	Trichlorofluoromethane		1 U	1 U
	Ethyl Ether		1 U	1 U
	1,1,2 Trichlorotrifluoroethane		1 U	1 U
b	1,1-Dichloroethene		1 U	1 U
	Acetone		84	244 E
	Methyl Iodide		1 U	1 U
	Carbon Disulfide		2 U	2 U
	Allyl Chloride		1 U	1 U
a	Methylene Chloride		1 U	1 U
	Acrylonitrile		5 U	5 U
	2-Methyoxy-2-Methylpropane		1 U	1 U
b	trans-1,2-Dichloroethene		1 U	1 U
	1,1-Dichloroethane		1 U	1 U
	2-Butanone (MEK)		2 U	3.7
b	cis-1,2-Dichloroethene		1 U	1.4
d	2,2-Dichloropropane		1 U	1 U
	Methyl acrylate		1 U	1 U
	Methyacrilonitrile		1 U	1 U
a	Bromochloromethane		1 U	1 U
a	Chloroform		2.7	2.5
	Tetrahydrofuran		2 U	2 U
c	1,1,1-Trichloroethane		1 U	1 U
	1-Chlorobutane		1 U	1 U
e	1,1-Dichloropropene		1 U	1 U
a	Carbon Tetrachloride		1 U	1 U
	1,2-Dichloroethane		1 U	1 U
	Benzene		1 U	1 U
	Trichloroethene		1 U	53
d	1,2-Dichloropropane		1 U	1 U
	Methyl Methacrylate		1 U	1 U
a	Dibromomethane		1 U	1 U
a	Bromodichloromethane		0.25 J	0.64 J
	2-Nitropropane		1.9 U	1 U
	Chloroacetonitrile		5 U	5 U
e	cis-1,3-Dichloropropene		1.1 U	1.1 U
	4-Methyl-2-Pentanone (MIBK)		0.48 J	0.28 J
	1,1-Dichloropropanone		1 U	1 U
	Toluene		1 U	1 U
e	trans-1,3-Dichloropropene		0.94 U	0.94 U
	Ethylmethacrylate		1 U	1 U
c	1,1,2-Trichloroethane		1 U	1 U

Appendix G - (cont'd) - Central Kitsap, January 1998.

	Location:	Bngr-1	Kport-1
	Type:	grab	grab
	Date:	1/27	1/27
	Time:	1300	1355
	Lab Log#:	058096	058098
(Group)[1]	VOA Compounds (cont'd)	ug/L	ug/L
d	1,3-Dichloropropane	1 U	1 U
	2-Hexanone	2 U	**2.2**
	Tetrachloroethene	1 U	1 U
a	Dibromochloromethane	**0.84 J**	**0.82 J**
	1,2-Dibromoethane (EDB)	1 U	1 U
g	Chlorobenzene	1 U	0.36 J
f	1,1,1,2-Tetrachloroethane	1 U	1 U
	Ethylbenzene	1 U	1 U
	m&p-Xylene	**0.22 J**	2 U
	o-Xylene	**0.15 J**	1 U
	Styrene (Ethenylbenzene)	1 U	1 U
a	Bromoform	1 U	1 U
	Isopropylbenzene	1 U	1 U
f	1,1,2,2-Tetrachloroethane	1 U	1 U
	Trans-1,4-Dichloro-2-butene	1 U	1 U
	1,2,3-Trichloropropane	1 U	1 U
	Bromobenzene	1 U	1 U
	n-Propylbenzene	1 U	1 U
	2-Chlorotoluene	1 U	1 U
	1,3,5-Trimethylbenzene	1 U	1 U
	4-Chlorotoluene	1 U	1 U
	tert-Butylbenzene	1 U	1 U
	1,2,4-Trimethylbenzene	1 U	1 U
	Pentachloroethane	1 U	1 U
	sec-Butylbenzene	1 U	1 U
	p-Isopropyltoluene	**2.4**	**0.31 J**
h	1,3-Dichlorobenzene	1 U	1 U
h	1,4-Dichlorobenzene	**2.2**	**0.62 J**
	n-Butylbenzene	1 U	1 U
h	1,2-Dichlorobenzene	1 U	1 U
	Hexachloroethane	1 U	1 U
	1,2-Dibromo-3-Chloropropane	1 U	1 U
	1,2,4-Trichlorobenzene	1 U	1 U
	Hexachlorobutadiene	1 U	1 U
	Naphthalene	1 U	1 U
	1,2,3-Trichlorobenzene	1 U	1 U

U - The analyte was not detected at or above the associated value.

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the associated estimated value.

E - Reported result is an estimate because of the presence of interference.

grab - grab sample

Bngr - Naval Submarine Base Bangor

Kport - Naval Undersea Warfare Engineering Station at Keyport

Appendix H - Glossary of Terms - Central Kitsap, January 1998.

BOD_5 - five day biochemical oxygen demand
C - Central Kitsap
comp - composite sample
E - Department of Ecology
Eff - effluent
EPA - United States Environmental Protection Agency
F-coli - fecal coliform bacteria
g - gram
gpm - gallons per minute
grab - grab sample
Inf - influent
MF - membrane filter
mg - milligram
mg/L - milligram per liter
NPDES - National Pollutant Discharge Elimination System
pH - $-\log_{10}$ (hydrogen ion concentration)
Prm - primary clarifier effluent
QA - quality assurance
QC - quality control
TNVS - total nonvolatile solids
TNVSS - total nonvolatile suspended solids
TOC - total organic carbon
TS - total solids
TSS - total suspended solids
"U" or "<" - The analyte was not detected at or above the reported result; or less than
WWTP - wastewater treatment plant